

REMARKS**NON-STATUTORY DOUBLE PATENTING**

Referring to the Office Action, the Examiner has rejected Claims 1 and 7 - 10 under the judicially created doctrine of obviousness-type double patenting, or non-statutory double patenting, as being unpatentable over Claims 1 - 10 of U.S. Patent No. 6,712,366 issued March 30, 2004 to Cargill.

As indicated in the Office Action and pursuant to 37 C.F.R. 1.130(b), a timely filed terminal disclaimer in compliance with 37 C.F.R. 1.321(c) may be used to obviate or overcome a non-statutory or judicially created double patenting rejection provided that the conflicting application or patent is shown to be commonly owned with the present Application.

In response to the non-statutory double patenting rejection of the Examiner, the Applicant encloses a Terminal Disclaimer in compliance with 37 C.F.R. 1.321(c) executed by the agent of record on behalf of the Applicant. In this regard, please note that each of the U.S. Patent, being U.S. Patent No. 6,712,366, and the within U.S. Application No. 10/769,761 are commonly owned by "Halliburton Energy Services, Inc."

Accordingly, it is respectfully submitted that this rejection of the Examiner has been fully addressed and overcome by the Terminal Disclaimer filed herein.

CLAIM REJECTIONS**REAL PARTY IN INTEREST**

The real party in interest is the assignee of record, i.e. Halliburton Energy Services, Inc.

STATUS OF CLAIMS

Claims 1 - 17 are pending in the within Application and the present Response is directed to all of pending Claims 1 - 17. No amendments are submitted herein. Rather, it is respectfully submitted that the rejections of the Examiner are overcome by the remarks that follow.

SUMMARY OF THE INVENTION

In a typical seal assembly, a seal element is retained by a seal housing. The seal element provides a sealing surface which in service may be exposed to a variety of forces acting on the seal which tend to move or distort the seal element. This movement or distortion may result in the seal failing to perform as intended. (Page 1, lines 12 - 17 of the Application).

The forces acting on the seal may be caused by a pressure differential across the seal element, in which case the sealing surface will tend to move or distort laterally within the seal housing either so that the sealing force exerted by the sealing surface against its abutting component is reduced or so that the seal element is "lifted" out of the seal housing by fluid which passes under pressure between the seal element and the seal housing. (Page 1, lines 19 - 25 of the Application).

The Applicant provides an improved seal assembly in which movement or distortion of the seal element is limited by providing one or more engagement forces between the seal element and the seal housing during service without having to permanently fix the seal element in the seal housing (Page 2, lines 26 - 30; Page 3, lines 4 - 9 of the Application). More particularly, as stated in the Application at Page 3, lines 11 - 14, the purpose of the Applicant's seal assembly is to limit "movement of the seal element in the seal housing by providing one or more engagement forces between the seal element and the seal housing during service, which engagement force in turn results in a frictional force which serves to restrain the seal element from movement in the seal housing."

The engagement force is provided by an isolated gap defined by an engagement surface which is oriented in a plane normal to the longitudinal axis of rotation of a rotatable component extending within the seal assembly. One advantage of the invention is that the

magnitude of the engagement force increases as the pressure acting on the seal element increases. (Page 3, lines 24 - 28 of the Application).

More particularly, referring to Figure 1 of the Application, the Applicant's seal assembly is comprised of a seal element (22) which has a sealing surface (26) and a seal engagement surface (34). The seal assembly is of a type for sealing with a **rotatable** component, preferably a rotatable shaft (28), which extends within the seal assembly and defines a **longitudinal axis of rotation**. Thus, the rotatable component (28) abuts against the sealing surface (26) of the seal element. In contrast, the seal engagement surface (34) is provided for engagement with the housing engagement surface (38) of the seal housing (24). The sealing surface (26) abuts the rotatable component, while the seal engagement surface (34) engages the seal housing. (Page 5, lines 4 - 16; Page 8, line 12 - Page 9, line 3 of the Application).

Further, one of the seal engagement surface and the housing engagement surface is comprised of a compressible material and the other is oriented in a plane normal to the longitudinal axis of rotation of the rotatable component which rotates within the seal assembly and provides the isolated gap for receiving the compressible material to restrain movement of the seal element relative to the seal housing (Page 5, lines 21 - 24 of the Application).

Increases in pressure applied to the seal element assist in maintaining the seal element, and preferably the debris side of the seal element (as shown as the first side (30) of the seal assembly in Figure 1), in engagement with the normal face of the adjacent seal housing. Specifically, the isolated gap of the engagement surface provides an engagement force between the seal element and the seal housing to restrain the movement of the seal element relative to the housing. Page 10, line 28 - Page 11, line 21 of the Application states the following regarding the function or purpose of the isolated gap:

"The gap (48) is isolated in that the seal engagement surface (34) effectively seals the gap (48) on all sides to trap low (atmospheric) pressure air in the gap while the seal assembly (20) is being assembled and to inhibit fluid from passing into the gap (48) while the seal is in service.

The combination of the compressible seal element (22) and the gap (48) thus permits a differential pressure between a pressure applied to the seal element (22) in

service and the atmospheric pressure inside the gap (48) to be transferred to the depression profile (50) as the seal element deforms and is pressed into the gap (48).

This differential pressure in turn provides an engagement force between the seal engagement surface (34) and the housing engagement surface (38) in the vicinity of the depression profile (50), which engagement force is approximately equal to the differential pressure multiplied by the area of the depression profile (50). The engagement force results in a frictional force between the seal element (22) and the seal housing (24) which acts to retain the seal element (22) in position relative to the seal housing (24).

The engagement force in the depression profile (50) increases as the pressure applied to the seal element (22) increases. As a result, one of the advantages of the invention is that the engagement force in the depression profile (50) may increase at the same time that other forces acting on the seal element (22) increase, thus providing additional resistance to movement of the seal element (22) as service conditions become more demanding."

ISSUES

The Examiner has rejected Claims 1 - 7, 9 and 11 - 16 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,842,287 issued June 27, 1989 to Weeks.

The Examiner has further rejected Claims 1 - 17 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 3,830,508 issued August 20, 1974 to Endicott in view of U.S. Patent No. 2,462,596 issued February 22, 1949 to Bent.

GROUPING OF THE CLAIMS

1. Independent claim 1 is independently and separately patentable.
2. Each of dependent Claims 2 - 17 is individually and separately patentable.
3. None of the Claims stand or fall together.

ARGUMENT**Independent Claim 1**

The Applicant's invention, as claimed in Claim 1, is directed at a seal assembly for sealing with a rotatable component extending within the seal assembly and defining a longitudinal axis of rotation. Further, the seal assembly is of a type including a seal element retained by a seal housing, wherein one of the seal element and the seal housing is comprised of a compressible material, wherein the seal element is comprised of a seal engagement surface and wherein the seal housing is comprised of a housing engagement surface for engaging the seal engagement surface.

In addition, one of the seal engagement surface and the housing engagement surface is comprised of a compressible material and the other of the seal engagement surface and the housing engagement surface is oriented in a plane normal to the longitudinal axis of rotation of the rotatable component extending within the seal assembly and providing an isolated gap between the seal engagement surface and the housing engagement surface.

(a) Anticipation

The Examiner states that Claim 1 is anticipated by Weeks.

Claim 1 claims a "seal assembly for sealing with a rotatable component extending within the seal assembly and defining a longitudinal axis of rotation." Further, the engagement surface is "oriented in a plane normal to the longitudinal axis of rotation of the component extending within the seal assembly and defining a depression for providing an isolated gap..." These features of the Invention claimed in Claim 1 are not described or shown by Weeks. In particular, Weeks does not describe a seal assembly for sealing with a rotatable component.

Weeks is directed at a helium pressure seal for a cryogenic refrigerator which utilizes a liner drive assembly. Specifically, the seal element (30) of Weeks, being a "soft metallic gasket", is sandwiched between two members which partially enclose the linear drive of the helium cryogenic refrigerator. The members have serrations for contacting opposite sides of the gasket.

As the members are comprised of metals harder than the gasket, the application of pressure which forces the members together causes the serrations of both members to be driven into the gasket material. (Column 1, lines 38 - 49 of Weeks).

Referring particularly to Figures 1 and 2 of Weeks, the seal member or gasket (30) is deformed between the opposed members, being a plate (31) and an adjacent flange (32), to seal the armature volume (12) of the linear drive unit from the external atmosphere (Column 3, lines 63 - 66 of Weeks). The plate (31) and the flange (32) are stationary or fixed relative to each other. Thus, the seal element (30) or gasket seals between two fixed or non-movable surfaces.

More particularly, the plate (31) is fixedly mounted to a stationary piston (11) comprising the linear drive assembly (Column 2, lines 37 - 50 of Weeks). The flange (32) is welded to a pressure housing (26) of the linear drive assembly (Column 4, lines 51 - 55 of Weeks). Therefore, neither the plate (31) nor the flange (32) are movably mounted within the liner drive assembly of Weeks.

Further, the plate (31) and the flange (32) are not movable relative to each other. Specifically, as shown in Figures 1, 5 and 6 of Weeks, the plate (31) and the flange (32) are bolted together to apply pressure to the gasket (30) therebetween. Column 4, lines 59 - 63 of Weeks states:

"Holes 120 are for bolts 121, which are used to compress the plate 31 and flange 32 together are arrayed about the serrations of each member to provide a uniform distribution of pressure."

As a result, in clear contrast with the Invention of Claim 1, Weeks does not describe or suggest in any manner whatsoever a seal assembly for sealing with a rotatable component as neither of the components sealed by the gasket are movable in any manner. Accordingly, it is respectfully submitted that Weeks does not describe or suggest an engagement surface for the gasket which is oriented in a plane normal to a longitudinal axis of rotation of a rotatable component. In other words, neither the plate (31) nor the flange (32) is oriented in a plane normal to a longitudinal axis of rotation of a rotatable component, given that there is no rotatable component and accordingly no longitudinal axis of rotation.

Further, the Examiner states that the seal assembly of Weeks is "capable of use with a rotatable component." However, the Examiner does not refer to any references or passages in Weeks or elsewhere to support this statement or which would motivate the adaptation suggested by the Examiner.

It is respectfully submitted that Weeks does not provide any suggestion whatsoever that the gasket structure may be adapted to permit its use with a rotatable component, nor is there any motivation to do so. All of the components of the seal assembly of Weeks (plate 31, flange 32 and gasket 30) are fixed or stationary relative to each other once the gasket (30) is clamped between the mating serrations of the flange (33) and the plate (31) which are bolted together.

Further, in any event, it is submitted that the gasket structure of Weeks is not capable of use, or adaptation for use, with a rotatable component. Both the plate (31) and the flange (32) define compatible serrations (37, 29). The serrations (37, 29) engage and deform opposed surfaces of the seal element (30) or gasket, which is positioned between the serrations in order to provide the seal between the plate and flange (31, 32). Thus, the seal element (30) would simply not be functional in the event of rotation of either the plate or flange.

Further, in order to anticipate a claim, the reference must teach each and every element of the claim (U.S. Manual of Patent Examining Procedure "MPEP" §2131). It is respectfully submitted that Weeks does not teach each and every element of independent Claim 1. Specifically, Weeks does not teach the other of the seal engagement surface and the housing engagement surface being oriented in a plane normal to the longitudinal axis of rotation of the rotatable component extending within the seal assembly, as claimed in Claim 1.

Accordingly, it is respectfully submitted that independent Claim 1 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 1 is unpatentable over Endicott in view of Bent.

It is submitted that neither Endicott nor Bent, alone or in combination, teach, describe or suggest the provision of an isolated gap in either a seal engagement surface or a housing engagement surface which is oriented in a plane normal to the longitudinal axis of rotation of the component extending within the seal assembly.

In summary, the seal assembly of Endicott is used for sealing with a rotatable component. However, Endicott utilizes a helical spring to provide a desired engagement force of the seal element with the rotatable component. Endicott does not teach or suggest the use of an isolated gap in any of the surfaces of the seal assembly.

The seal assembly of Bent provides a seal for a component having a longitudinal axis and provides an engagement surface defining a gap. However, the gap is oriented in a plane parallel with the longitudinal axis of the component. Bent does not teach or suggest the use of a gap in a plane normal to the longitudinal axis of rotation of the component.

Further, the structure of the seal assembly claimed in Claim 1 is particularly configured to provide an engagement force between the seal element and the seal housing in order to inhibit movement of the seal element within the seal housing upon rotation of the rotatable component. In clear contrast, the seal assemblies of both Endicott and Bent are particularly provided to enhance the sealing between the seal element and the component itself, rather than the seal housing.

In other words, it is submitted that the structure, function and result of Endicott and Bent all differ significantly from that of the Applicant's invention as claimed in Claim 1. The particular distinctions are set out in greater detail below.

(i) Endicott

Endicott is directed at a seal assembly between a housing (32) and a cylindrical shaft (34) movable with respect to the housing. The seal assembly includes an annular seal member (38) which is "nested" within a hole (36) in the housing. The annular seal member has an inner diameter which surrounds the shaft. The seal member further includes a V-shaped notch adjacent

to the inner diameter and a relieved portion for forming a lip (51) of the seal member. The lip (51) provides the sealing surface (44) for sealing between the seal member and the cylindrical shaft extending within the seal assembly. (Column 1, lines 23 - 30; Column 3, lines 18 - 39 of Endicott).

Further, the seal member (38) defines an annular outer surface (62) and a back surface (64) which sealingly contacts an adjacent surface of the hole (36) within the housing. (Column 3, lines 46 - 52 of Endicott). The back surface (64) of the seal member (38) and the adjacent surface of the hole (36) are oriented in a plane normal to the longitudinal axis of the cylindrical shaft. However, as acknowledged by the Examiner, Endicott does not disclose a depression for providing an isolated gap between the back surface (64) of the seal member (38) and the adjacent surface of the hole (36) in the housing.

The engagement of the sealing surface (44) of the lip (51) of the sealing member with the cylindrical surface and the engagement of the back surface (64) of the seal member with the housing are both maintained by a combination of a spacer (40) and a spring (42). The spacer (40) includes a circular protrusion (52) which is forced into contact with the inner portion of the V-shaped notch in the annular seal member by the spring (42) to cause both the back surface (64) and the annular outer surface (62) of the seal member to bear against the housing and the lip (51) to bear against the cylindrical shaft. The spring therefor provides both an axial and radial seal loading force. (Column 1, lines 31 - 43; Column 3, lines 40 - 57 of Endicott).

Column 1, lines 38 - 42 of Endicott states that "both axial and radial seal loading is provided by the spring eliminating the need for separate axial and radial loading means ..." Further, Column 2, lines 6 - 17 of Endicott states that "the seal radial forces are generated through the use of a single external spring."

Thus, the combination of the spacer and spring is clearly intended to be provided as the sole means or mechanism for providing loading or engagement forces between the seal member and the housing.

Further, as Endicott relies solely upon the spring to generate the seal loading forces, “means must be provided to prevent the overloading of the seal.” This means include an abutment surface on the seal member which engages a face on the spacer to provide a stand-off height (71) therebetween to prevent overloading. (Column 4, lines 6 - 14 of Endicott). Any additional loading beyond a predetermined level is absorbed by compression of the material of the annular seal member (Column 1, lines 59 - 61 of Endicott).

There is no discussion, description or suggestion whatsoever of the varying of the seal engagement forces, either radially or axially, by providing an isolated gap in one of the engagement surfaces. Further, there is no discussion, description or suggestion whatsoever of providing any gap or space of any type for receiving the compressible material to restrain movement of the seal element relative to the housing.

In summary, Endicott provides a single compression spring (42) and associated spacer (40) as the sole means of maintaining the back surface (64) of the seal member in engagement with the adjacent hole surface (36) of the housing. There is no discussion or suggestion whatsoever of the provision of a depression in any of the engagement surfaces between the seal element (38) and the hole (36) in the housing, and in particular, there is no discussion or suggestion whatsoever of the provision of a depression in either the back surface (64) of the seal member (38) or the adjacent surface of the hole (36).

(ii) Bent

Bent relates to a seal or packing “for use between a pair of cooperating elements which may be movable relative to each other, such as a piston and a cylinder ...” (Column 1, lines 1 - 4 of Bent). It is the expressed object of Bent “to provide a novel packing structure for use between two elements movable relative to each other, which packing structure will function under the influence of any degree of fluid pressure to prevent excessive friction between the elements and at the same time maintain a tight seal between the elements.” (Column 1, lines 6 - 23 of Bent). Thus, the expressed purpose and function of the packing in Bent is “to establish an effective seal at all fluid pressures” between the packing and the wall of the cylinder (Column 1, lines 24 - 29 of Bent).

In other words, in contrast to the Applicant's claimed invention, the purpose of Bent relates directly to the abutment of the sealing surface of the packing with the adjacent surface of the cylinder wall. Specifically, Bent is directed at avoiding the creation of excessive friction between the sealing surface of the packing and the cylinder wall. The Applicant's invention is not directed at providing compensation for increasing pressure on the seal element which creates increasing friction between the seal element (22) and the component (28) extending within the seal assembly. Rather, the Applicant's invention is directed at maintaining the engagement between the seal element (22) and the surrounding seal housing (24), and particularly between the seal engagement surface (34) and the housing engagement surface (38) to restrain movement of the seal element relative to the seal housing.

To perform its expressed, and differing, function, Bent describes a resilient sealing ring for use in a groove formed in one of a pair of cooperating elements (i.e. piston or cylinder) having opposite co-axial cylindrical faces, wherein a wall of the groove has a single recess or depression formed therein (Column 1, lines 1 - 5 and 24 - 33; Column 3, lines 35 - 47; Column 4, lines 22 - 41 and lines 45 - 47; Column 4, lines 45 - 55 of Bent).

More particularly, the recess (7) is specifically formed in the bottom or inner surface (5) of the groove (4) formed in the first cooperating element (i.e. the piston), opposite the co-axial cylindrical face of the second cooperating element (i.e. the cylinder wall (2)) (Column 2, lines 18 - 29; Figures 1 - 7 of Bent). In other words, the surface of the groove defining the recess is oriented in a plane parallel with the longitudinal axis of the movable component.

The specific structure and orientation of the surface defining the groove in Bent is particularly provided to permit the invention of Bent to perform its intended function as outlined above. Both the structure and the function of Bent thus differ from that of the Applicant's invention as claimed in Claim 1.

In use, the sealing ring of Bent is squeezed or pressed between the wall of the cylinder and the bottom or inner surface of the groove. In response to increasing pressure applied between the cylinder wall and the sealing ring, the sealing ring is displaced radially, away from the cylindrical

face of the cylinder wall (the "component") and toward the bottom or inner surface of the groove (which is oriented in a plane parallel with the cylinder wall or longitudinal axis of the component), for receipt in the annular recess formed in said parallel surface (Column 2, lines 18 - 44 of Bent).

The recess is therefore specifically placed or located in the surface of the groove opposing the cylindrical face of the cylinder wall (i.e. in a plane parallel with the longitudinal axis of the component) to provide a radial space for receipt of the sealing ring upon the application of additional fluid pressure between the cylinder wall and the sealing ring. This is expressly stated in Bent at Column 2, line 45 - Column 3, line 2:

"Now when the piston 1 is subjected to the pressure of fluid, the fluid pressure may flow by way of the clearance space between the piston 1 and the cylinder wall 2 to a portion of the packing ring 3 and exert a force thereon radially inward of the piston, or to the right as viewed in the drawing. Thus it will readily be seen that any fluid pressure which is communicated to the periphery of the piston will act on the packing ring only in a direction to cause the material of the ring to flow into the recess 1 and any unfilled space in the groove 4, thus insuring against excessive pressure of the packing ring against the cylinder wall."

The Examiner states that the recess of Bent is further provided to restrain movement of the seal relative to the housing. However, Column 3, lines 15 - 20 of Bent states:

"The flat surface which engages the cylinder wall, having its edges rounded, and the packing ring being distorted against the side walls of the groove, and into the annular recess, all serve to prevent the packing ring from rolling along the cylinder wall."

Rolling of the packing ring along the cylinder wall will only occur upon the reciprocating relative movement of the piston and cylinder wall or movement along or in the direction of the longitudinal axis thereof. Thus, the Examiner's statement regarding the restraint of movement is only applicable where the component extending within the seal assembly is a reciprocating component. There will be no tendency for the seal member to "roll" where the component extending within the seal assembly is a rotatable component, as claimed by the Applicant.

(iii) Endicott in view of Bent

In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the references. Further, the prior art references must teach or suggest all the claim limitations. (MPEP §2143, §2143.01, §2143.03)

It is respectfully submitted that Endicott and Bent fail to teach or suggest all of the claim limitations of Claim 1. Specifically, neither Endicott nor Bent teaches or suggests the engagement surface "being oriented in a plane normal to the longitudinal axis of rotation of the component extending within the seal assembly AND defining a depression for providing an isolated gap ..."

Further, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's claimed invention.

Endicott provides a single spring for maintaining both the back surface (64) of the seal element (38) and the annular outer surface (62) of the seal element (38) in engagement with the adjacent surfaces of the hole (36) of the housing. As a result of the use of the spring, Endicott states that means must be provided to prevent overloading of the seal element.

Bent is also directed at the prevention of overloading of the seal member. Specifically, Bent provides a recess in a groove of the housing to prevent excessive pressure or friction from being applied to the seal member, wherein the recess is particularly located in a surface oriented in a plane parallel to the shaft extending therein. The surface defining the recess is oriented in a plane parallel to the longitudinal axis of the cylinder extending within the piston in order to permit the radial displacement of the seal member outwardly for receipt in the recess.

The surface of Bent which is oriented parallel with the shaft and which defines the recess therein is equivalent to the surface of the hole (36) of the housing adjacent to the annular outer surface (62) of the seal element (38) of Endicott. The surface of the hole (36) of the housing adjacent to the annular outer surface (62) of Endicott is similarly oriented parallel with the shaft (34), however, it does not define a recess therein.

Bent also prevents "rolling" of the seal member where the component extending within the seal assembly is a reciprocating component. This purpose would not be applicable to either Endicott or the Applicant's invention given that the component extending within the seal assembly is a rotatable component in each case and there would be no tendency for the seal member to "roll."

Accordingly, any motivation or suggestion to combine the references would exist with respect to the function or purpose of preventing excessive pressure being applied to the seal member. Specifically, Endicott presently provides a "stand-off height (71)" for preventing overloading of the seal element. Bent provides a recess in a surface oriented parallel with the shaft for preventing overloading of the seal member. Thus, if Endicott were to be combined with Bent, the "stand-off height (71)" of Endicott required to prevent overloading of the seal element would be replaced with the recess of Bent, which performs the same function.

As a result, if the recess of Bent were combined with Endicott, the recess would necessarily be located within the surface of the hole (36) of the housing adjacent to the annular outer surface (62) of the seal element (38), which is oriented in a plane parallel with the longitudinal axis of the shaft extending within the seal assembly.

Even if the "anti-rolling" function of Bent were applicable to Endicott, if the recess of Bent were combined with Endicott for this purpose, the recess would still be located within the surface of the hole (36) of the housing adjacent to the annular outer surface (62) of the seal element (38), which is oriented in a plane parallel with the longitudinal axis of the shaft extending within the seal assembly.

There is no motivation or suggestion in either of the references for locating or positioning the recess on a surface oriented in a plane normal to the longitudinal axis of rotation of the shaft, such as the surface of the hole (36) of the housing adjacent the back surface (64) of Endicott, for any reason whatsoever.

As well, Endicott requires the use of a spring to maintain the engagement of the seal element with the seal housing. There is no suggestion or motivation in Endicott whatsoever to use

any alternate means in place of the spring. The Applicant's seal assembly as claimed in Claim 1 does not require a spring to maintain the engagement between the seal engagement surface and the housing engagement surface. Rather, one of the seal and housing engagement surfaces is oriented in a plane normal to the longitudinal axis of rotation of the component extending within the seal assembly and provides an isolated gap for restraining movement between the seal element and the seal housing. This arrangement provides a sufficient engagement force to maintain the surfaces in engagement.

Accordingly, it is respectfully submitted that independent Claim 1 is patentably distinguishable over Endicott in view of Bent.

Dependent Claim 2

Claim 2 depends from Claim 1 and defines the additional limitation of the depression being "comprised of at least one circumferential groove."

(a) Anticipation

The Examiner states that Claim 2 is anticipated by Weeks.

As claim 2 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 2 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 2 is unpatentable over Endicott in view of Bent.

As Claim 2 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 2 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 3

Claim 3 depends from Claim 1 and defines the additional limitation of the depression being "comprised of at least one circumferential groove extending for a length equal to the circumference of the other of the seal engagement surface and the housing engagement surface."

(a) Anticipation

The Examiner states that Claim 3 is anticipated by Weeks.

As claim 3 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 3 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 3 is unpatentable over Endicott in view of Bent.

As Claim 3 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 3 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 4

Claim 4 depends from Claim 1 and defines the additional limitation of the depression being "comprised of a plurality of substantially parallel circumferential grooves."

(a) Anticipation

The Examiner states that Claim 4 is anticipated by Weeks.

As claim 4 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 4 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 4 is unpatentable over Endicott in view of Bent. However, with regard to Claim 4, the Examiner states that "neither Endicott nor Bent discloses a plurality of depressions/grooves."

In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the references. Further, the prior art references must teach or suggest all the claim limitations. (MPEP §2143, §2143.01, §2143.03)

It is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 4. In this regard, the argument set out above for Claim 1 is equally applicable to Claim 4.

Further, Endicott does not disclose a depression at all. As well, Endicott does not provide any suggestion or motivation to modify either the surface of the hole (36) of the housing or the adjacent surface of the seal element (38) to provide a single depression, much less a plurality of depressions. Thus, Endicott cannot be viewed as teaching or suggesting "a plurality ... of grooves."

Additionally, Bent does not provide any suggestion or motivation to modify the single recess described therein to provide for a plurality of recesses, particularly given that there is no suggestion in Bent that greater than one recess would be desirable for any reason. Rather, the use of a plurality of recesses may inhibit or hinder the intended function of the recess. Further, even if a plurality of recesses were suggested, which is denied, there is certainly no suggestion of their specific configuration.

As well, it is respectfully submitted that it would not have been obvious for one of ordinary skill in the art to duplicate the recess of Bent where there is no motivation or suggestion in Bent that greater than one recess would be desirable for any reason. The recess of Bent is provided solely as a means for "insuring against excessive pressure of the packing ring against the cylinder wall" (Column 2, line 51 - Column 3, line 2 of Bent). The provision of a plurality of recesses in Bent may inhibit or hinder the ability of the sealing ring to be displaced laterally to relieve the excessive friction on the sealing ring.

The Applicant's seal assembly, as claimed in Claim 4, provides a plurality of grooves in order to increase the surface area of the depression and thereby increase the engagement force. In other words, the engagement force may be varied by increasing or decreasing the surface area of the depression. Page 10, line 23 - Page 11, line 14 of the Application states:

"The combination of the compressible seal element (22) and the gap (48) thus permits a differential pressure between a pressure applied to the seal element (22) in service and the atmospheric pressure inside the gap (48) to be transferred to the depression profile (50) as the seal element deforms and is pressed into the gap (48).

This differential pressure in turn provides an engagement force between the seal engagement surface (34) and the housing engagement surface (38) in the vicinity of the depression profile (50), which engagement force is approximately equal to the differential pressure multiplied by the area of the depression profile (50). The engagement force results in a frictional force between the seal element (22) and the seal housing (24) which acts to retain the seal element (22) in position relative to the seal housing (24)."

In addition, the particular shape or configuration of the depression may be varied to achieve a number of objectives as discussed in the Application at Page 11, line 23 - Page 12, line 28. In this regard, the particular shape of the depression may be particularly selected as follows:

"...the orientation of the depression (42) may be designed so that the engagement force caused by pressurization of the seal element (22) provides shear resistance as well as frictional resistance to movement of the seal element (22). In this regard, the grooves (44) depicted in Figure 2 will provide shear and frictional resistance against lateral movement of the seal element (22) in the seal assembly (20) of Figure 1 but only frictional resistance against rotation of the seal element...

...the grooves (44) as depicted in Figure 2 may conceivably contribute a separate sealing function to the seal assembly (20) to prevent the passage of pressurized fluid

between the seal engagement surface (34) and the housing engagement surface (38). In this regard, each groove (44) may function similar to an O-ring, thus effectively providing a "seal within a seal" to further enhance the reliability of the seal assembly (20)."

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests "a plurality of substantially parallel circumferential grooves." Therefore, it is respectfully submitted that Claim 4 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 4 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 4 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 5

Claim 5 depends from Claim 1 and defines the additional limitation of the depression being "comprised of a plurality of substantially parallel and concentric circumferential grooves."

(a) Anticipation

The Examiner states that Claim 5 is anticipated by Weeks.

As claim 5 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 5 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 5 is unpatentable over Endicott in view of Bent. However, with regard to Claim 5, the Examiner states that "neither Endicott nor Bent discloses a plurality of depressions/grooves."

Thus, the detailed argument set out above with respect to Claim 4 is equally applicable with respect to Claim 5. In particular, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 5.

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests "a plurality of substantially parallel and concentric circumferential grooves." Therefore, it is respectfully submitted that Claim 5 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 5 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 5 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 6

Claim 6 depends from Claim 1 and defines the additional limitation of the depression being "comprised of a plurality of substantially parallel and concentric circumferential grooves, wherein each of the grooves extends for a length equal to the circumference of the other of the seal engagement surface and the housing engagement surface."

(a) Anticipation

The Examiner states that Claim 6 is anticipated by Weeks.

As claim 6 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 6 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 6 is unpatentable over Endicott in view of Bent. However, with regard to Claim 6, the Examiner states that “**neither Endicott nor Bent discloses a plurality of depressions/grooves.**”

Thus, the detailed argument set out above with respect to Claims 3 - 5 is equally applicable with respect to Claim 6. In particular, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 6.

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests “a plurality of substantially parallel and concentric circumferential grooves, wherein each of the grooves extends for a length equal to the circumference of the other of the seal engagement surface and the housing engagement surface.” Therefore, it is respectfully submitted that Claim 6 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 6 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 6 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 7

Claim 7 depends from Claim 1 and defines the seal assembly as further comprising “a preloading mechanism for urging the seal engagement surface and the housing engagement surface into engagement with each other.”

(a) Anticipation

The Examiner states that Claim 7 is anticipated by Weeks.

As claim 7 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 7 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 7 is unpatentable over Endicott in view of Bent.

It is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 7.

The Applicant's preloading mechanism applies a preloading force to urge the seal engagement surface and the housing engagement surface into engagement with each other. The purpose of this preloading force is to provide an initial engagement force between the seal engagement surface and the housing engagement surface to inhibit the passage of fluid between the engagement surfaces in order to enable the engagement force to develop as the pressure applied to the seal element increases while the seal assembly is in service. (Page 7, lines 6 - 12; Page 13, lines 12 - 18 of the Application). Thus, the preloading mechanism is provided for a purpose particularly related to the presence of the depression and the isolated gap provided thereby.

Endicott describes a spring (42) which urges the back surface (64) of the seal element (38) into contact with the adjacent surface of the annular hole (36). However, as discussed in detail with respect to Claim 1, if the recess of Bent were combined with Endicott, the recess would necessarily be located adjacent the annular outer surface (62) of the seal element (38), which is oriented in a plane parallel with the longitudinal axis of the shaft extending within the seal assembly. Thus, the spring (42) of Endicott would not be oriented to urge the annular outer surface (62) of the seal element (38) with the adjacent surface of the annular hole (36).

It is respectfully submitted that neither of the references teaches or suggests the combination of one of the engagement surfaces being oriented in a plane normal to the longitudinal axis of rotation of the component and defining a depression AND a preloading mechanism for urging the engagement surfaces into engagement with each other. Therefore, it is respectfully submitted that Claim 7 is patentably distinguishable over Endicott in view of Bent.

In addition, as Claim 7 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 7 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 8

Claim 8 depends from Claim 7 and further defines the preloading mechanism as being "comprised of at least one spring which is retained by the seal housing."

The Examiner states that Claim 8 is unpatentable over Endicott in view of Bent.

As Claim 8 depends from Claim 7, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 7, it is respectfully submitted that dependent Claim 8 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 9

Claim 9 depends from Claim 1 and defines the additional limitation of the seal element being "comprised of a compressible material" and the depression being "defined by the housing engagement surface."

(a) Anticipation

The Examiner states that Claim 9 is anticipated by Weeks.

As claim 9 depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 9 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 9 is unpatentable over Endicott in view of Bent.

As Claim 9 depends from Claim 1, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 1, it is respectfully submitted that dependent Claim 9 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 10

Claim 10 depends from Claim 9 and further defines the seal element as being "comprised of a resilient compressible material."

The Examiner states that Claim 10 is unpatentable over Endicott in view of Bent.

As Claim 10 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 10 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 11

Claim 11 depends from Claim 9 and further defines the depression as being "comprised of at least one circumferential groove." The limitation of Claim 11 is the same as the limitation of Claim 2.

(a) Anticipation

The Examiner states that Claim 11 is anticipated by Weeks.

As claim 11 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 11 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 11 is unpatentable over Endicott in view of Bent.

As Claim 11 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 11 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 12

Claim 12 depends from Claim 9 and defines the additional limitation of the depression being "comprised of at least one circumferential groove extending for a length equal to the circumference of the housing engagement surface." The limitation of Claim 12 is similar to the limitation of Claim 3.

(a) Anticipation

The Examiner states that Claim 12 is anticipated by Weeks.

As claim 12 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 12 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 12 is unpatentable over Endicott in view of Bent.

As Claim 12 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 12 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 13

Claim 13 depends from Claim 9 and defines the additional limitation of the depression being "comprised of a plurality of substantially parallel circumferential grooves." The limitation of Claim 13 is the same as the limitation of Claim 4.

(a) Anticipation

The Examiner states that Claim 13 is anticipated by Weeks.

As claim 13 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 13 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 13 is unpatentable over Endicott in view of Bent. However, with regard to Claim 13, the Examiner states that "**neither Endicott nor Bent discloses a plurality of depressions/grooves.**"

The detailed argument set out above with respect to Claim 4 is equally applicable with respect to Claim 13. In particular, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 13.

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of

the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests "a plurality of substantially parallel circumferential grooves." Therefore, it is respectfully submitted that Claim 13 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 13 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 13 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 14

Claim 14 depends from Claim 9 and defines the additional limitation of the depression being "comprised of a plurality of substantially parallel and concentric circumferential grooves." The limitation of Claim 14 is the same as the limitation of Claim 5.

(a) Anticipation

The Examiner states that Claim 14 is anticipated by Weeks.

As claim 14 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 14 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 14 is unpatentable over Endicott in view of Bent. However, with regard to Claim 14, the Examiner states that "neither Endicott nor Bent discloses a plurality of depressions/grooves."

The detailed argument set out above with respect to Claims 4, 5 and 13 is equally applicable with respect to Claim 14. In particular, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 14.

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests “a plurality of substantially parallel and concentric circumferential grooves.” Therefore, it is respectfully submitted that Claim 14 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 14 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 14 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 15

Claim 15 depends from Claim 9 and defines the additional limitation of the depression being “comprised of a plurality of substantially parallel and concentric circumferential grooves, wherein each of the grooves extends for a length equal to the circumference of the housing engagement surface.” The limitation of Claim 15 is similar to the limitation of Claim 6.

(a) Anticipation

The Examiner states that Claim 15 is anticipated by Weeks.

As claim 15 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 15 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 15 is unpatentable over Endicott in view of Bent. However, the Examiner states that regarding Claim 15, “**neither Endicott nor Bent discloses a plurality of depressions/grooves.**”

The detailed argument set out above for Claims 3 - 5 and 12 - 14 is equally applicable with respect to Claim 15. In particular, it is respectfully submitted that neither Endicott nor Bent provides any suggestion or motivation to combine the references to provide for the Applicant's invention, as claimed in Claim 15.

Further, it is respectfully submitted that *prima facie* obviousness has not been established as all of the claim limitations are not taught or suggested by the prior art. As acknowledged by the Examiner, neither of the prior art references discloses a plurality of grooves. Further, neither of the references suggests the plurality of grooves. Thus, clearly, neither of the references teaches or suggests “a plurality of substantially parallel and concentric circumferential grooves, wherein each of the grooves extends for a length equal to the circumference of the other of the seal engagement surface and the housing engagement surface.” Therefore, it is respectfully submitted that Claim 15 is patentably distinguishable over Endicott in view of Bent.

Finally, as Claim 15 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 15 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 16

Claim 16 depends from Claim 9 and defines the seal assembly as further comprising “a preloading mechanism for urging the seal engagement surface and the housing engagement surface into engagement with each other.” The limitation of Claim 16 is the same as the limitation of Claim 7.

(a) Anticipation

The Examiner states that Claim 16 is anticipated by Weeks.

As claim 16 depends from Claim 9 (which in turn depends from Claim 1 which contains a limitation which is not taught by Weeks, as detailed above for Claim 1), it is respectfully submitted that dependent Claim 16 is not anticipated by Weeks.

(b) Obviousness

The Examiner further states that Claim 16 is unpatentable over Endicott in view of Bent.

The detailed argument set out above for Claim 7 is equally applicable with respect to Claim 16. Further, as Claim 16 depends from Claim 9, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claims 1 and 9, it is respectfully submitted that dependent Claim 16 is also patentably distinguishable over Endicott in view of Bent.

Dependent Claim 17

Claim 17 depends from Claim 16 and further defines the preloading mechanism as being "comprised of at least one spring which is retained by the seal housing." The limitation of Claim 17 is the same as the limitation of Claim 8.

The Examiner states that Claim 17 is unpatentable over Endicott in view of Bent.

As Claim 17 depends from Claim 16, which is patentably distinguishable over Endicott in view of Bent, as detailed above for Claim 16, it is respectfully submitted that dependent Claim 17 is also patentably distinguishable over Endicott in view of Bent.

SUMMARY

It is therefore respectfully submitted that independent Claim 1 is patentable and allowance of independent Claim 1 is respectfully requested.

Dependent Claims 2 - 17 all depend directly or indirectly from independent Claim 1. Thus, it is further respectfully submitted that the dependent Claims are allowable for the reasons supporting the allowability of independent Claim 1, as well as for the distinctions defined therein. Therefore, allowance of these Claims is also respectfully requested.

In view of the foregoing remarks, it is submitted that this Application is in condition for allowance and allowance is respectfully requested.

Respectfully submitted,
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